

CLAIMS

What is Claimed Is:

1. A biocompatible implant for surgical implantation comprising:

5 a matrix comprising a resorbable thermoplastic-ceramic composition, the matrix having a pore size and porosity effective for enhancing bone growth adjacent the composition,

10 wherein the implant provides mechanical support for natural bone structure for a predetermined period of time to allow the natural bone structure to grow adjacent the material.

15 2. The implant of claim 1 wherein the natural bone structure substantially replaces the implant after a predetermined time.

20 3. The implant of claim 1 wherein the matrix includes a polymeric material selected from the group consisting of polymethylmethacrylate, polybutyleneterephthalate, and polyethyletherketone and combinations thereof.

4. The implant of claim 3 wherein the implant also includes a growth-enhancing composition for stimulating new tissue growth at the site of implantation.

25 5. The implant of claim 4 wherein the resorbable material degrades upon implantation at a first rate to provide load-bearing support for a predetermined period of time and the growth-enhancing composition degrades upon implantation at a second rate faster than the first rate to stimulate new tissue growth on the implant.

6. The implant of claim 4 wherein the growth-enhancing composition includes a biocompatible polymer-ceramic composition and a calcium source.

7. The implant of claim 6, wherein the growth-enhancing composition further comprises one or more transforming growth factors.

8. The implant of claim 6 wherein the polymer-ceramic composition is selected from the group consisting of polycaprolactone, copolymers of polylactic acid and-polyglycolic acid, linear aliphatic polyesters, and blends thereof.

9. The implant of claim 4 wherein the growth-enhancing composition is blended with the resorbable material of the body.

10. The implant of claim 6 wherein the calcium source is calcium sulfate in fibrous form and wherein the calcium source is blended into the resorbable material.

10 11. A biomedical implant comprising:

a porous structure formed from a thermoplastic material and having a porosity between about 25% to about 70% by volume and a pore size between about 100 to about 2400 μm ; and

15 a ceramic composition for enhancing the rate of bone growth, wherein the composition coats at least a portion of the structure or fills at least a portion of the pores of the structure.

12. The implant of claim 11 wherein the thermoplastic material is a resorbable material that degrades at a first rate to provide load-bearing support for a predetermined period of time and the ceramic composition degrades at a second rate faster than the first 20 rate to stimulate initial tissue growth on the implant.

13. The biomedical implant of claim 11 wherein the structure has a porosity between about 50% to 60% by volume and a pore size between about 150 to about 400 μm .

14. The biomedical implant of claim 11 wherein the porous structure is selected from the group consisting of polymethylmethacrylate (PMMA), polybutyleneterephthalate (PBT), polyethyletherketone (PEEK), polyethyleneterephthalate (PET), high molecular weight polyethylene with hydrogel filling and combinations thereof

5 15. The biomedical implant of claim 11 wherein the ceramic composition includes a polymer and a calcium source.

16. A method of fabricating a biomedical implant comprising the steps of:

10 (a) forming a feedrod from a polymer composition selected from the group consisting of polymethylmethacrylate, polybutyleneterephthalate, and polyethyletherketone;

(b) passing a first amount of the feedrod through a dispensing head and onto a working surface in a predetermined pattern to form a first layer of the polymer composition on the surface;

15 (c) passing a second amount of the feedrod through the dispensing head and onto the previously-formed first layer in a predetermined pattern to form a multilayer object having a predetermined porosity; and

(d) applying onto the multiplayer object a biocompatible composition in an amount effective for enhancing bone growth to provide a porous implant object.

17. The method of claim 16 wherein the porous implant object is heated for a time and at a temperature effective for annealing the object.

20 18. The method of claim 16 wherein a thin, flexible material is wrapped around the porous implant object and a vacuum applied to provide an outer covering for holding the biocompatible composition on the multiple layer object.

19. The method of claim 16 wherein the multiplayer object has a porosity of between about 25% to about 70% by volume and a pore size between about 100 to about 2400 μm .

20. The method of claim 16 wherein the biocompatible composition includes 5 a ceramic composition selected from the group consisting of polylactic acid, polyglycolic acid, polylactic acid-polyglycolic acid copolymer, polycaprolactone, and combinations thereof.

21. The method of claim 20 wherein the biocompatible composition further comprises a calcium source.

10 22. The method of claim 21 wherein the ceramic composition and the calcium source are blended at ratios of between about 1:1 to about 1:5.

23. The method of claim 16 wherein the viscosity of the polymer composition is between about 100 to about 500 centipoise at temperatures between about 80° to about 100°C.

15 24. An implant formed by the method of claim 16.

25. A method of repairing or replacing tissue comprising the steps of: forming a biocompatible substrate including a polymer composite selected from the group consisting of polymethylmethacrylate, polybutyleneterephthalate, and polyethyletherketone and a growth-enhancing composition including a ceramic 20 composition selected from the group consisting of polylactic acid, polyglycolic acid, polylactic acid-polyglycolic acid copolymer, polycaprolactone, and combinations thereof, wherein the biocompatible substrate has a porosity effective for enhancing new growth of bone and tissue; and

surgically implanting the biocompatible substrate *in vivo* at a desired site of repair to provide a foundation for new bone and tissue growth.

26. The method of claim 25 wherein the biocompatible substrate is a
resorbable material that degrades at a first rate to provide load-bearing support for a
5 predetermined period of time and the growth-enhancing composition degrades at a
second rate faster than the first rate to stimulate initial tissue growth on the substrate.